1,177,882

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Anchor Rod Assembly

I, LOUIS LAMENDIN, a French citizen of 22, Rue Fontaine del Saulx, Lille (Nord), France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described, in and by the following statement:—

The invention relates to assemblies for anchor rods, and more particularly to such rods for use in mine galleries.

Anchor rods are often used to support galleries in mines. An anchor rod is a long steel rod which is inserted in a hole in the roof or in the side wall of a gallery and which is anchored or sealed at the bottom of the hole. The rod has a support plate, usually deformable, and a nut which locks the support plate against the rock. Amongst other uses, such a rod can connect the gallery roof, which may be in danger of falling or breaking, to the more compressed rock above, which is more likely to remain in being.

Anchor rods known in the art are usually made from ribbed rods, of the kind used for reinforcing concrete, to increase the grip of the rod in the hole in the rock. Usually, such rods have diametrically opposed longitudinal ribs, between which are transverse or helical anchoring ribs; the rods may also be provided with recesses.

Known anchor rod assemblies are unsatisfactory in that they do not allow movement of the rock without exposing the rod to breakage, and it is an object of this invention to avoid this disadvantage as far as possible.

According to this invention, an anchor rod assembly comprises a rod, a support plate on the rod, a bush on the rod, and a thrust transmitting member or cage enclosing the bush, the rod having a reduced diameter portion on which the bush is mounted, and the bush acting as a drawing die for elongating the reduced diameter portion.

The invention will be further described, by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is an axial cross-section of an anchor rod assembly with a bush sliding on a smooth portion of a ribbed rod;

Fig. 2 is a perspective view of an expandible bush;

Fig. 3 and 4 are axial cross-sections of modifications, each having a bush with a slightly frusto-conical outer surface;

Fig. 5 shows an anchor rod with ribbed and smooth portions;

Fig. 6 is an axial cross-section of an assembly with a bush on a smooth part of the rod of Fig. 5; and

Fig. 7 shows a ribbed anchor rod with an unribbed, threaded end part.

Fig. 1 shows an anchor rod assembly having a ribbed rod 1 with a reduced diameter, un-ribbed portion 2, which is smooth and which is at a distance from the free end of the rod, as related to possible movement of a wall or roof. The ribbed part of the rod has longitudinal ribs 3 and 4 diametrically opposed, and inclined anchoring ribs 5, distributed over the length of the ribbed part of the rod. Over the portion 2 is fitted a bush 6 of hard, tempered steel, having at the ends of its cylindrical or slightly frusto-conical bore unequal chamfers 7 and 8, so that the bore of the bush acts in the manner of a drawing die. The bush may be in two or more parts, or may be in the form of an expandible bush 9 (Fig. 2) having slots 10 starting alternately from one end and the other, as shown.

The bush 6 is enclosed by a thrust transmitting member or cage 11 whose base 12, serving as a seat, rests on a support plate 13 the other surface of which is locked against a wall or roof surface to be supported, and transmitting thrust to the rod 1.

The size of the reduced diameter portion 2

is such that, during movement of the support plate 13, the rod 1 can be stretched, without breaking.

In the embodiment of Figure 3, in order to avoid having to reduce excessively the thickness of the ribbed part of the rod which receives the bush 14, the latter is forcibly mounted, with precompression of the rod. To this end, the bore of the cage 15 is slightly conical. The cage is so dimensioned that its inherent elasticity does not come into play and it operates below its elastic limit. The outer surface 16 of the bush 14 is turned in a similar manner, but its diameter is slightly larger than the inner diameter of the cage such that the bush is embedded forcibly in the cage and embraces and compresses the rod 1 strongly. The relative movement of the cage 15 relative to the bush 14 and the rod 1 is limited by a base 17 of the cage, which rests on the support plate 13.

When the pulling force is to be as constant as possible the cage 15 in Fig. 3, operating below its elastic limit, is replaced by a cage 18 with smaller outer diameter, as shown in Fig. 4 which operates close to its elastic limit. The diameter of the frusto-conical bore of this cage is smaller than that of the outer surface of the bush 19. Relative movement of the cage 18 relative to the bush 19 is limited by the support plate 13. During assembly, or on movement of the supported rock, the cage 18 on the bush 19 is expanded and at the same time, the bush exerts strong pressure on the rod 1. The rod is machined so that it is slightly frusto-conical at the reduced diameter portion, widening towards its free end, as shown in Figure 4, thus having two oppositely directed frusto-conical portions. When the thrust of the rock moves the bush on the frusto-conical surface, the diameter of the cage is increased. However, since the cage has reached its elastic limit, this increase in diameter will lead to only a very small increase in the strain rate so that the locking effect remains virtually constant.

Preferably, the anchor rod is formed from a round iron bar comprising, according to Fig. 5, short smooth portions 20 of a diameter which only slightly exceeds that of the adjacent ribbed portions. Appropriate cutting makes it possible to use such an iron bar for making anchor rods. The cylindrical portions not used for bush assembly can be reduced to the required diameter, for example by turning.

Fig. 6 shows the use of a bar according to Fig. 5; a bush 22 is mounted on a reduced diameter portion 23 of slightly smaller diameter than the smooth portion 20 of a rod 21. A cage 24 surrounds the bush 22 which rests on the base 25 of the cage.

For some applications, a smooth end portion 20 of a rod having a bush assembly can be threaded and equipped with a nut 26, see Fig. 7. The diameter of the rod at the bottom of the thread is then equal to, or slightly larger, than that of the ribbed part.

WHAT WE CLAIM IS:—

1. An anchor rod assembly, for example for supporting the roof of a mine gallery, comprising a rod, a support plate on the rod, a bush on the rod, and a thrust transmitting member or cage enclosing the bush, the rod having a reduced diameter portion on which the bush is mounted, and the bush acting as a drawing die for elongating the reduced diameter portion.

2. An assembly according to claim 1 wherein the bush is of tempered steel.

3. An assembly according to claim 1 or claim 2 wherein the bush is in one part.

4. An assembly according to claim 1 or claim 2 wherein the bush is in more than one part.

5. An assembly according to claim 3 wherein the bush is axially slotted.

6. An assembly according to claim 1 or claim 2 wherein the bore of the bush is outwardly chamfered at an end thereof.

7. An assembly according to any of claim 1 or claim 2 wherein the bore of the bush is frusto-conical.

8. An assembly according to any preceding claim wherein the rod is ribbed.

9. An assembly according to any preceding claim wherein the reduced diameter portion has a smooth surface.

10. An assembly according to any preceding claim wherein the bush and cage are movable in use on the rod when transmitting thrust from the support plate to the rod, the reduced diameter portion being such as to permit a given amount of elongation such as will accommodate a given thrust from the support plate.

11. An assembly according to claim 1 wherein the reduced diameter portion is cylindrical.

12. An assembly according to claim 1 wherein the reduced diameter portion is formed by two oppositely directed frusto-conical portions.

13. An assembly according to claim 5 wherein the bush is axially slotted alternately from one end and the other.

14. An assembly according to any preceding claim wherein the outer diameter of the bush is slightly greater than the internal diameter of the cage.

15. An assembly according to claim 14 wherein one end of the bush and the adjacent end of the cage both abut the support plate.

16. An assembly according to claim 1 wherein one end of the bush abuts an inwardly extending portion of the cage, the cage abutting the support plate.

17. An anchor rod assembly substantially as herein described, with reference to the accompanying drawings.

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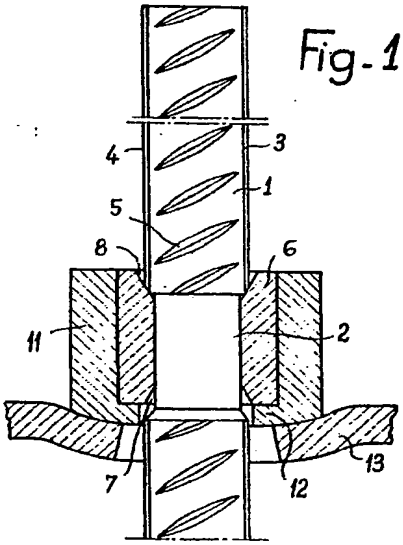
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig. 1



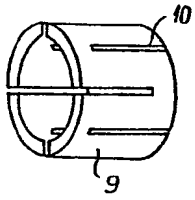


Fig. 2

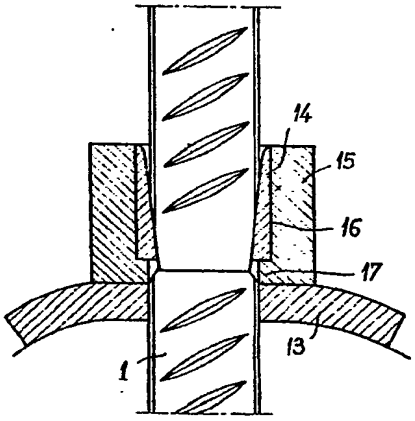


Fig. 3

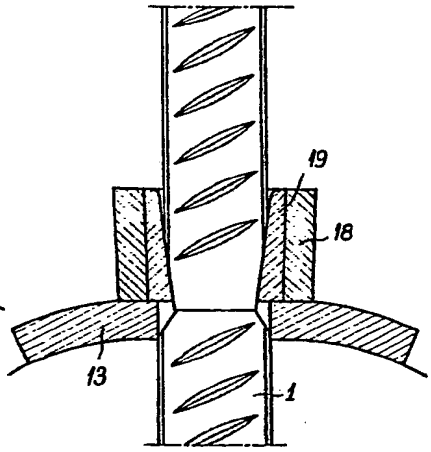


Fig. 4

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Sheet 2

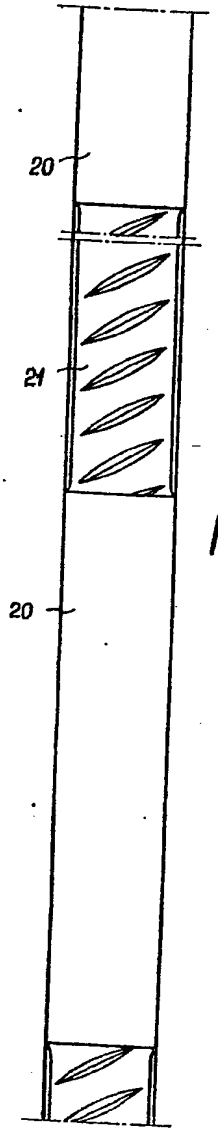

Fig. 5

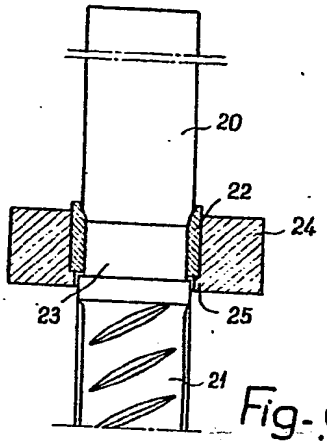

Fig. 6

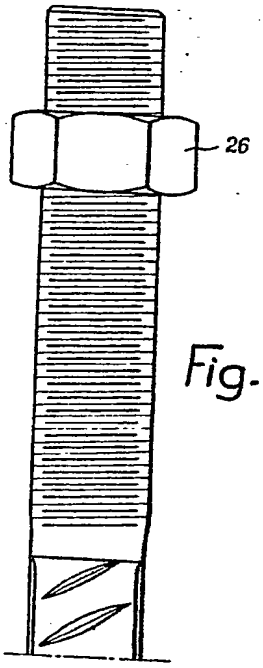

Fig. 7